

nence or boss. Curving across the middle of the bone are the *upper and lower temporal lines* or ridges, for attachment of the temporal fascia and muscle; and near the posterior superior angle is often a *parietal foramen* transmitting a small vein to the superior longitudinal sinus (sometimes a small branch of the occipital artery).

The *inner surface* is concave, and its deepest part is the *parietal*



FIG. 3.—Left parietal bone, external surface.

fossa. It is marked with numerous smooth *digital depressions* for the brain convolutions, with a shallow *half groove* (Fig. 4) along the superior border for the superior longitudinal sinus, and several *Pacchionian depressions*. There are furrows for arteries and often the opening of the parietal foramen.

How is it developed?

In membrane, from two centers which coalesce at the eminence, appearing at the fifth to sixth fetal week.

Give muscular attachments and articulations.

Temporal muscle: articulates with five bones, the opposite parietal, occipital, temporal, frontal, and sphenoid.

The Occipital Bone.

Of what parts does this bone consist?

The occipital bone is a curved, trapezoidal plate situated at the posterior part and base of the skull. It is convex posteriorly and concave anteriorly. At birth the bone consists of four



FIG. 4.—Left parietal bone, internal surface (Gray).

pieces. At its lower and anterior part is the foramen magnum. Behind this is a *tabular portion* (squamo-occipital), the upper part of which may be separate, the *interparietal bone* (bone of the Incas); the lower part is *supra-occipital*. On either side of the foramen are *condylar portions* (ex-occipitals), and in front is the *basilar portion* (basi-occipital). The bone may be described by its fetal divisions or as a whole; in the latter case it presents two surfaces, four borders, and four angles. The *external surface* (Fig. 5) presents midway between the sum-

mit and foramen magnum the *external occipital protuberance* (inion) for attachment of the *ligamentum nuchæ* and *biventer cervicis* muscle. Descending from it to the foramen is the *median external occipital crest*. The *ligamentum nuchæ* is attached to it also. Passing outward from the protuberance on each side to the lateral angle is the *superior curved line*, or *superior nuchal line*. Internally and above this line

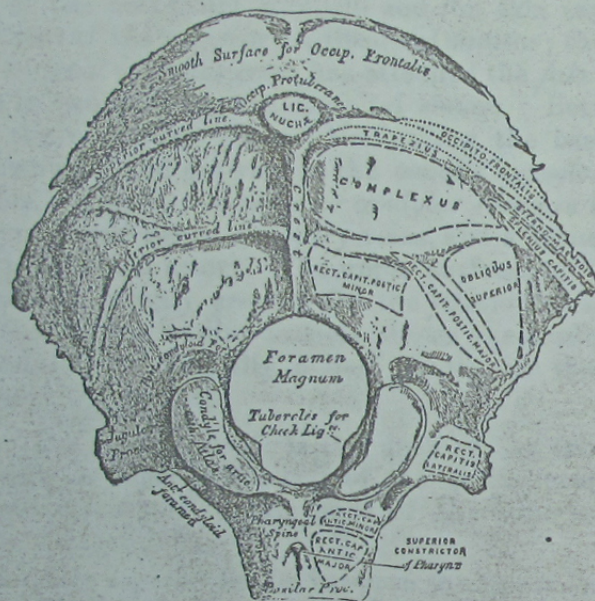


FIG. 5.—Occipital bone, outer surface (Gray).

is often the *supreme curved line* for attachment of the middle portion of the *occipito-frontalis* aponeurosis. Between these two lines the bone is smooth and dense, the *torus transversus* (transverse bulge). From the middle of the external crest a semicircular *inferior curved line* runs outward on each side and bends sharply downward to the jugular process. To the superior curved line is attached internally the *trapezius* and externally the *occipitalis* and *sterno-mastoid* muscles. Below this line internally is a large impression for the *complexus*; then come the *superior oblique* and *splenius capitis* above and externally. To the inferior line and depressions below it are attached the *rectus capitis posticus minor* internally and the *major*

externally. The *foramen magnum* is an oval aperture, 30 to 35 mm. in its long axis. It transmits the spinal cord and its membranes, the spinal part of the spinal accessory nerves, vertebral and spinal arteries, and occipito-axial ligaments. It is broader behind than in front, and bevelled internally. The *condyles* are situated on either side of the anterior half of the foramen for articulation with the atlas. They converge in front, are reniform, with smooth, oblong, articular surfaces looking down-

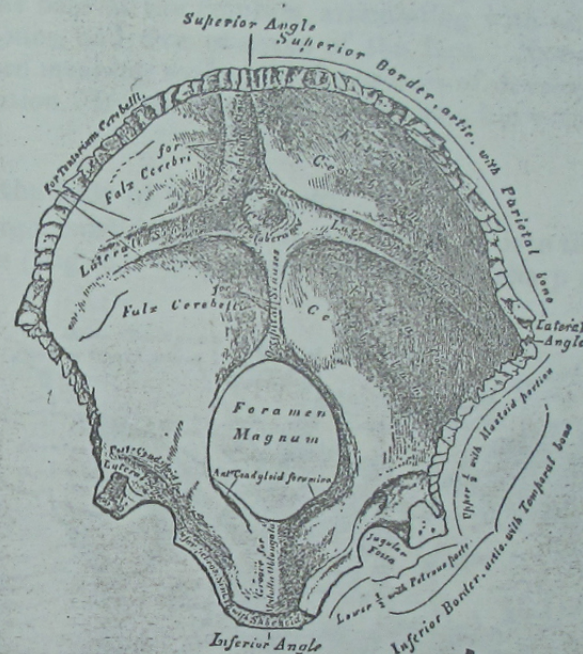


FIG. 6.—Occipital bone, inner surface (Gray).

ward and outward. Internally is a depression for the insertion of a check ligament. Behind the condyle is the *posterior condylar fossa*, often containing the *posterior condylar foramen* for transmission of a vein. External to the condyle is the *jugular process*, presenting a *jugular notch* in front, which forms a part of the jugular foramen. The under surface presents an eminence (*paramastoid*), the attachments of the *rectus capitis lateralis* muscle and of a lateral ligament; the outer surface is a rough, cartilaginous facet for articulation with the temporal bone. The *basilar process* projects forward and upward in front of the foramen. It is narrow and thick in front. On

the under surface it presents the *pharyngeal spine* for the attachment of the superior constrictor of the pharynx, and impressions for the rectus capitis anticus major and minor muscles.

Describe the cerebral surface of the bone (Fig. 6).

It is deeply concave, divided into four *fossæ* by a *crucial grooved ridge*, crossing at a prominent *internal occipital protuberance*; the two upper fossæ lodge the occipital lobes of the cerebrum, the two lower, the hemispheres of the cerebellum; the two lateral and superior grooves lodge, respectively, between the layers of the tentorium cerebelli and the falx cerebri, the lateral and part of the superior longitudinal sinuses; the inferior groove, or *internal occipital crest*, has attached the *falx cerebelli*, and lodges in two grooves, the *occipital sinuses*. Between the sinuses is the *vermiform fossa*. Perforating the base of the condyle downward and outward is the *canalis hypoglossi*, sometimes double, ending in the *anterior condylar foramen* transmitting the hypoglossal nerve, emissary veins, and a branch of the ascending pharyngeal artery. The upper surfaces of the jugular processes are deeply *grooved* for the lateral sinuses. The upper surface of the basilar process shows the *basilar groove* for the medulla, and laterally a half groove for the inferior petrosal sinus.

Angles.—The *superior angle* is the apex of the tabular portion; the *inferior angle* is the end of the basilar process; the *lateral angles* correspond to the ends of the superior curved lines.

Borders.—The *superior border* between the upper and lateral angles forms the lambdoid suture, occipito-parietal; the upper part of an *inferior border* extends from the lateral angle to the jugular process, masto-occipital; the lower part articulates with the petrous portion of the temporal, petro-occipital suture, which presents posteriorly the *jugular foramen* (foramen lacerum posterius).

Attachment of muscles.

Thirteen pairs, as mentioned above.

With what bones does it articulate?

Two parietal, two temporal, sphenoid, and atlas; six in all.

What centers of ossification has it?

Four in the tabular portion; upper pair in membrane (eighth fetal week), one for the basilar, and one for each condyloid portion in cartilage (seventh or eighth fetal week); in four pieces at birth, in the sixth year it forms one bone.

The Sphenoid Bone.

What are its divisions and where is it situated?

A *body*, two *lesser wings*, two *greater wings*, two *pterygoid plates*, two *spinous processes*, and six *clinoid processes*; it is situated at the base of the cranium, articulating with all the other cranial bones, and five or seven of the face. Named from a Greek word meaning *wedge*; in the process of development this is its function. It also somewhat resembles a bat with extended wings.

Describe the body of the sphenoid.

It is large, cuboidal, hollowed out (in adult) into the *sphenoidal sinuses* (Fig. 8). *Superiorly*, in front, is a sharp projecting

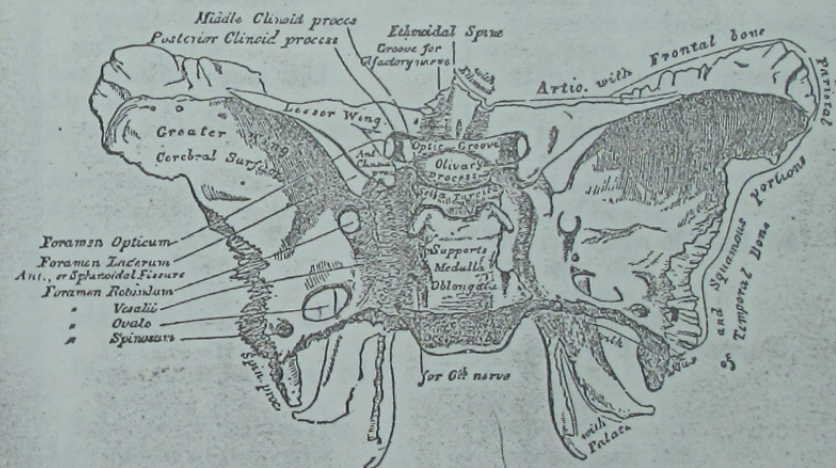


FIG. 7.—Sphenoid bone, superior surface (Gray).

ethmoidal spine for the ethmoid; behind this, a smooth surface with a longitudinal eminence producing two shallow *olfactory grooves*, bounding which behind is a transverse *optic groove* (Fig. 7), lodging the optic commissure, terminating in two *optic*

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